CONIC SECTIONS HYPERBOLAS!

Name Key

Period ____ Date ____________

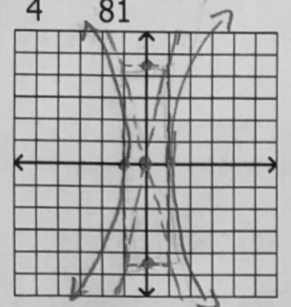
Use simplest radical form where appropriate (no decimals!)

1. Find the requested information, then graph the hyperbola.

a. $\frac{x^2}{4} - \frac{y^2}{81} = 1$

Horiz.
$a = 2$
$b = 9$

$c^2 = 4 + 81$
$c^2 = 85$
$c = \sqrt{85}$



center: $(0,0)$

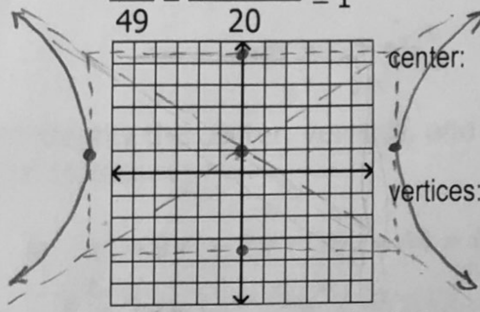
vertices: $(2,0)$ $(-2,0)$

length of transverse axis: 4

foci: $(\sqrt{85}, 0)$ $(-\sqrt{85}, 0)$

b. $\frac{x^2}{49} - \frac{(y-1)^2}{20} = 1$

Horiz. $a = 7$
$b = \sqrt{20} = 2\sqrt{5}$



center: $(0,1)$

vertices: $(7,1)$ $(-7,1)$

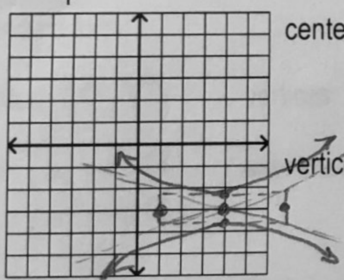
length of transverse axis: 14

foci:
$c^2 = 49 + 20$
$c^2 = 69$
$c = \sqrt{69}$
$(\sqrt{69}, 1)$ $(-\sqrt{69}, 1)$

c. $\frac{(y+3)^2}{\frac{1}{4}} - \frac{(x-4)^2}{9} = 1$

Vert.
$a = \frac{1}{2}$
$b = 3$

$c^2 = \frac{1}{4} + 9$
$c^2 = \frac{37}{4}$
$c = \frac{\sqrt{37}}{2}$



center: $(4,-3)$

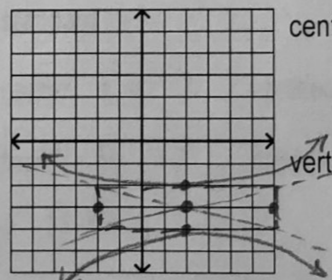
vertices: $(4, -5/2)$ $(4, -7/2)$

length of transverse axis: 1

foci: $(4, -3 - \frac{\sqrt{37}}{2})$ $(4, -3 + \frac{\sqrt{37}}{2})$

d. $(y+3)^2 - \frac{(x-2)^2}{16} = 1$

Vert.
$a = 1$
$b = 4$



center: $(2,-3)$

vertices: $(2,-2)$ $(2,-4)$

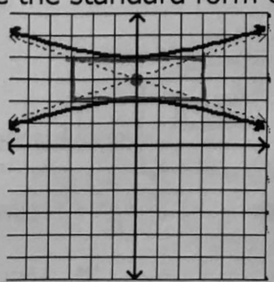
length of transverse axis: 2

foci:
$c^2 = 16 + 1 = 17$
$c = \sqrt{17}$
$(2, -3 - \sqrt{17})$
$(2, -3 + \sqrt{17})$

2. Write the standard form equation of the hyperbola shown or described.

a.

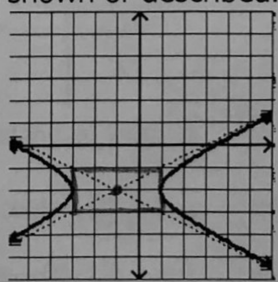
Vertical
$C(0,3)$



Identify the foci:
$c^2 = 9 + 1 = 10$
$c = \sqrt{10}$
$(0, 3 + \sqrt{10})$
$(0, 3 - \sqrt{10})$

$\frac{(y-3)^2}{1} - \frac{x^2}{9} = 1$

b.



$C(-1,-2)$

Identify the foci:
$c^2 = 4 + 1 = 5$
$c = \sqrt{5}$
$(-1 + \sqrt{5}, -2)$
$(-1 - \sqrt{5}, -2)$

$\frac{(x+1)^2}{4} - \frac{(y+2)^2}{1} = 1$

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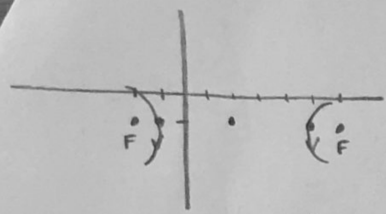
c. Vertices: (-1, -1) and (5, -1)
Foci: (-2, -1) and (6, -1)

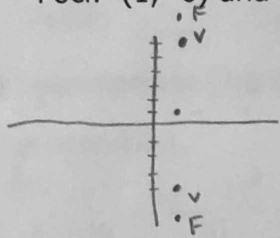
Horiz. C(2,-1)



$$\boxed{\frac{(x-2)^2}{9} - \frac{(y+1)^2}{7} = 1}$$

$16 = 9 + b^2$
$7 = b^2$

d. Vertices: (1, -4) and (1, 6) vertical
Foci: (1, -6) and (1, 8) C(1,1)



$$\boxed{\frac{(y-1)^2}{25} - \frac{(x-1)^2}{24} = 1}$$

$49 = 25 + b^2$
$b^2 = 24$

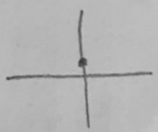
4. Convert each equation into standard form, then identify the center, vertices, and foci of the hyperbola, and find the equations of its asymptotes.

a. $y^2 - 4x^2 - 2y - \cancel{36}\,^{35} = 0$

$(y^2 - 2y + \underline{1}) - 4x^2 = 35 + \underline{1}$

$\frac{(y-1)^2}{36} - \frac{4x^2}{36} = \frac{36}{36}$

$$\boxed{\frac{(y-1)^2}{36} - \frac{x^2}{9} = 1}$$



standard form:

center: (0, 1) vertices: (0,7) (0,-5)

foci: $(0,\ 1 + 3\sqrt{5})$
$(0,\ 1 - 3\sqrt{5})$
~~asymptotes~~:

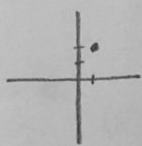
$c^2 = 36 + 9$
$c = \sqrt{45} = 3\sqrt{5}$

b. $x^2 - 9y^2 - 2x + 36y - 44 = 0$

$x^2 - 2x + \_ - 9y^2 + 36y + \_ = 44 + \_ + \_$

$(x^2 - 2x + \underline{1}) - 9(y^2 - 4y + \underline{4}) = 44 + \underline{1} + \underline{-36}$

$\frac{(x-1)^2}{9} - \frac{9(y-2)^2}{9} = \frac{9}{9}$



$$\boxed{\frac{(x-1)^2}{9} - (y-2)^2 = 1}$$

standard form:

center: (1, 2) vertices: (4, 2) (-2, 2)

foci: $(1+\sqrt{10},\ 2)$
$(1-\sqrt{10},\ 2)$
~~asymptotes:~~

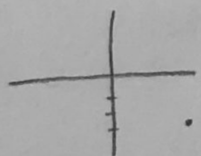
$c^2 = 9 + 1$
$c = \sqrt{10}$

c. $x^2 - 4y^2 - 28x - 24y + 156 = 0$

$x^2 - 28x + \_ - 4y^2 - 24y + \_ = -156 + \_ + \_$

$(x^2 - 28x + \underline{196}) - 4(y^2 + 6y + \underline{9}) = -156 + \underline{196} + \underline{-36}$

$\frac{(x-14)^2}{4} - \frac{4(y+3)^2}{4} = \frac{4}{4}$



standard form: $\boxed{\frac{(x-14)^2}{4} - \frac{(y+3)^2}{1} = 1}$

center: (14, -3) vertices: (16, -3) (12, -3)

foci: $(14+\sqrt{5},\ -3)$
$(14-\sqrt{5},\ -3)$
~~asymptotes~~:

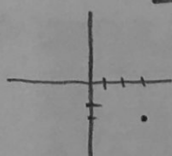
$c^2 = 4 + 1 = 5$
$c = \sqrt{5}$

d. $x^2 - 4y^2 - 6x - 16y - 43 = 0$

$x^2 - 6x + \_ - 4y^2 - 16y + \_ = 43 + \_ + \_$

$(x^2 - 6x + \underline{9}) - 4(y^2 + 4y + \underline{4}) = 43 + \underline{9} + \underline{-16}$

$\frac{(x-3)^2}{36} - \frac{4(y+2)^2}{36} = \frac{36}{36}$



standard form: $\boxed{\frac{(x-3)^2}{36} - \frac{(y+2)^2}{9} = 1}$

center: (3, -2) vertices: (6, -2) (0, -2)

foci: $(3+3\sqrt{5},\ -2)$
$(3-3\sqrt{5},\ -2)$
~~asymptotes~~:

$c^2 = 36 + 9$
$c = \sqrt{45} = 3\sqrt{5}$

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